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Two new species of *Ephysteris* Meyrick, 1908, from Asia with brachypterous males (Lepidoptera, Gelechiidae)

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Abstract. Two new species of Gelechiidae: *Ephysteris kullbergi* **sp. n.** from Tuva (Russia) and *Ephysteris ustjuzhanini* **sp. n.** from Mongolia are described. In both species the hindwings in both sexes are distinctly reduced. The adults and genitalia are illustrated. Brachyptery in Gelechiidae and *Ephysteris* is briefly discussed, and type locality of *E. kullbergi* **sp. n.** is illustrated. The locomotion of *E. kullbergi* **sp. n.** is described.

Introduction

The genus *Ephysteris* Meyrick, 1908, comprises about 60 predominately Old World species (Karsholt and Sattler 1998). About 25 Palaearctic species are distributed mainly in the Mediterranean zone of Europe and in the arid and mountainous regions of Central and Eastern Asia (Povolný 2002; Bidzilya and Li 2008; Huemer and Karsholt 2010). Six species are known from the New World (Landry and Roque-Albelo 2010). More than 20 species have been recorded from Africa (Bidzilya and Mey 2011).

Most Palaearctic species of *Ephysteris* constitute a quite homogeneous group and they were united in the subgenus *Microcraspedus* Janse, 1958 (= *Opacopsis* Povolný, 1964), based on similarities in the genitalia (Povolný 1964, 1966). Two species, *E. promptella* (Staudinger, 1859) and *E. subdiminutella* (Stainton, 1867), which are distinct morphologically, were treated as members of separate monotypic subgenera, *Ephysteris* (*E. promptella*) and *Ochrodia* Povolný, 1966 (*O. subdiminutella*). Later Povolný (1989, 2002) raised the rank of these subgenera to genera. In their treatment of the European fauna Huemer and Karsholt (2010) list *Microcraspedus* as a synonym of *Ephysteris* and *Ochrodia* as a valid genus.

Within the Gnorimoschemini *Ephysteris* is closely related to *Vladimirea* Povolný, 1967, but differs in having a narrower tegumen, relatively short valva and often more or less modified segment VIII in the male genitalia. The female genitalia are characterized by the sub-triangular signum with distinctly produced apices in combination with the usually long sclerotized posterior portion of the ductus bursae.

Generic relationships among Gnorimoschemini are not fully understood and synapomorphic characters are putative at best. Species of *Ephysteris* share the long sacculus (1/2–3/4 length of valva) and the well-developed gnathos with *Vladimirea* and *Microlechia* Turati, 1924, but differ from the former in the short valva (considerably shorter than the length of tegumen and uncus), longer and narrower saccus, and often more or less modified segment VIII in the male genitalia.

Microlechia species differ from *Ephysteris* in the longer, sickle-shaped gnathos, the sub-ovate uncus and the apically pointed sacculus.

In both male and female *Ephysteris* the hindwings of some species can be reduced, being distinctly shorter, either elongate without distinct emargination of the termen or broader with a rounded margin. Several veins are lost (Karsholt and Sattler 1998: 44). At present only three brachypterous *Ephysteris* species are known, namely from Morocco (*E. curtipennis* (Zerny, 1936)), Afghanistan (*E. kasyi* Povolný, 1968) and Madeira (*E. brachyptera* Karsholt and Sattler, 1998) respectively.

Abbreviations of institutional collections

MZH Finnish Museum of Natural History, Helsinki, Finland
ZMKU Zoological Museum, Kiev Taras Shevchenko National University, Kiev, Ukraine
ZMUC Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Taxonomy

Ephysteris kullbergi sp. n.

http://zoobank.org/8010A3AF-4D2F-4C49-A5DF-D08865E93907

Material examined. Holotype, ♂. "RUSSIA Tuva rep. 50°01'N, 95°03'E, 1150 m, Lake Tere-Khol, sand dunes 9.–12.6.1995 Jalava & Kullberg leg." "genitalia slide 153/16, O. Bidzilya" (MZH).

Paratypes. 29 ♂, 14 ♀, same data as holotype, genitalia slides 4873♂ and 4874♀ O. Karsholt (MZH, ZMKU, ZMUC).

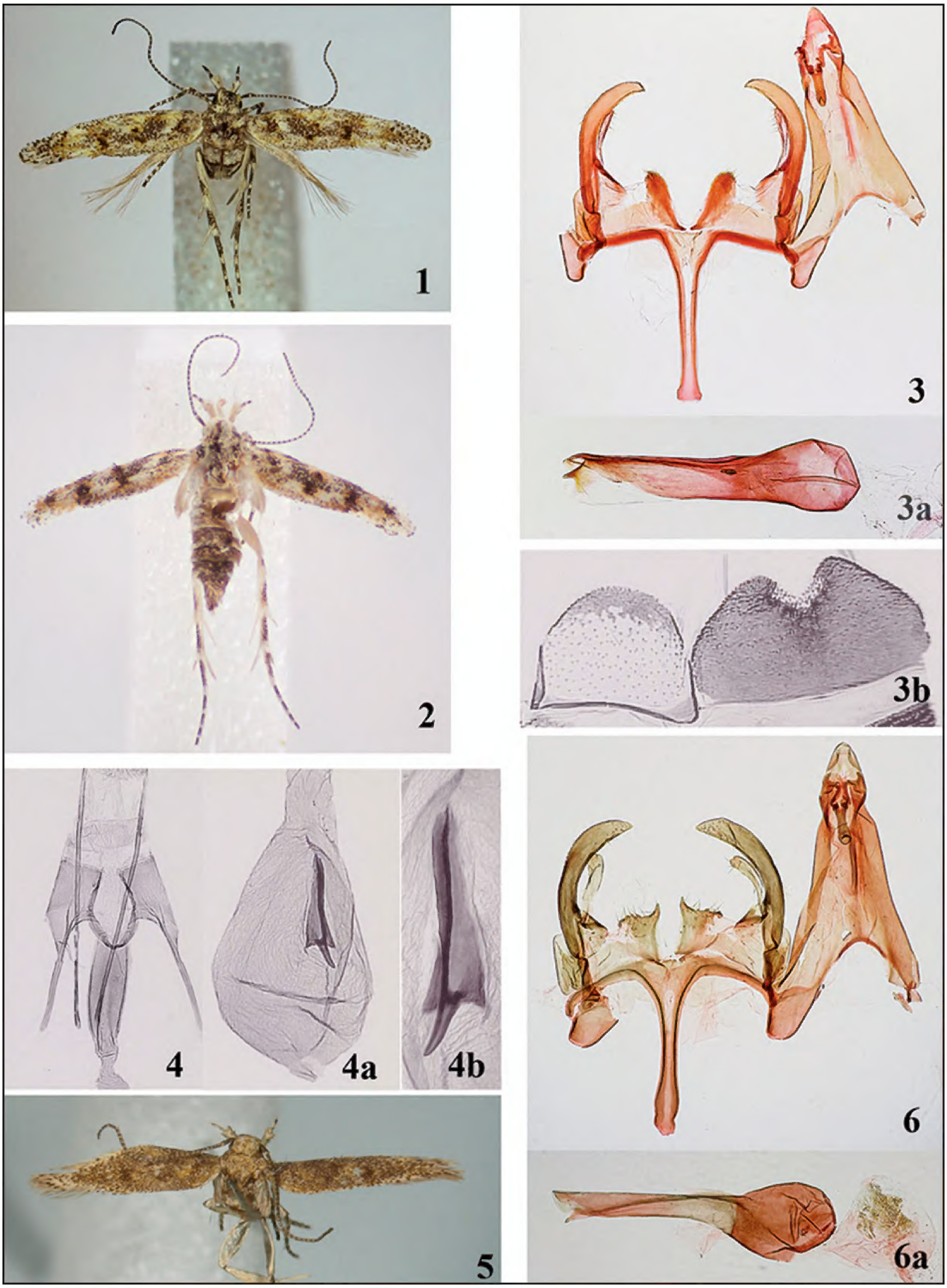
Description. Adult (Figs 1–2). Male. Wingspan 8–10 mm. Labial palpus cream-white; segment 2 with two black spots on outer surface; segment 3 shorter than segment 2, with a slender basal and a broader apical black ring. Antenna black, ringed with white and grey. Head, thorax and tegulae cream-white mottled with blackish brown; frons lighter. Ground-colour of forewing cream-white, mottled with yellow, orange, brown and black scales; subcostal stripe yellow; four brown and black transverse fasciae near base, at 2/5, 3/5 and near apex all with erect scales; fringe with black-tipped white scales. Hindwing lanceolate, about three-fifths length of forewing, light grey-brown; fringe reduced to some light grey hairs.

Female. Hindwing shorter, length 1.0–1.7 mm, and broader than in male; otherwise similar to male.

Variation. There is some variation in the amount of light and dark scales in the forewings. Worn specimens tend to look paler than fresh ones. There is some variation in the length and shape (more or less rounded) of the hindwing in the females.

Male genitalia (Fig. 3). Uncus sub-triangular; gnathos-hook about length of uncus, slender; valva curved, digitate, not reaching base of gnathos; sacculus narrow, digitate, almost straight, extending beyond middle of valva; posterior margin of vinculum with broad lateromedial humps with dentate posterior margin, medially with short V-shaped emargination; saccus about same length as valva, moderately stout, distally two-thirds with parallel sides before sub-rectangular tip; phallus of similar length as tegumen, almost straight, apical sclerite distinct, weakly inflated coecum about one-fourth length of phallus.

Female genitalia (Fig. 4). Segment VIII with almost evenly sclerotized subgenital plates, smooth; ostium bursae projected anteriorly with oval edge; antrum tubular, short, slightly exceeding apophysis anterioris; apophysis anterioris stout, rod-like, about length of segment VIII; ductus



Figures 1–6. 1–4. *Ephysteris kullbergi* sp. n. **1.** Adult, holotype, male. **2.** Adult, paratype, female. **3.** Male genitalia, holotype (gen. slide 153/16, O. Bidzilya). **3a.** Phallus. **3b.** Abdominal segment VIII (gen. slide 4873, O. Karsholt). **4.** Female genitalia (gen. slide 4874, O. Karsholt). **4a.** Corpus bursae. **4b.** Signum enlarged. **5, 6.** *Ephysteris ustjuzhanini* sp. n. **5.** Adult, holotype, male. **6.** Male genitalia (gen. slide 210/14, O. Bidzilya). **6a.** Phallus.

Figures 7, 8. Sand dunes near Lake Tere-Khol, type locality of *Ephysteris kullbergi* sp. n.

bursae broad; corpus bursae oval; signum about half length of corpus bursae, sub-triangular, medially with longitudinal ridge, anteriolateral lobes short, anteriomedial lobe rather long and pointed.

Diagnosis. *E. kullbergi* is characterized by the reduced hindwings in both sexes. It can be separated from other brachypterous *Ephysteris* species by the more vivid coloration and the many erect brown and black scales in the forewing. The female genitalia are similar to those of several congeners, especially *E. diminutella* (Zeller, 1847) and *E. insulella* (Heinemann, 1870), but can be recognized in having the antrum slightly exceeding the apophysis anterioris, and by the short and broad anteriolateral lobes of the signum. The male genitalia are similar to those of several congeners, especially *E. diminutella*, but can be recognized by having shorter valvae, saccus and phallus and less emarginated posterior margin of the vinculum.

Distribution. Russia: Tuva Republic.

Biology. Host-plant and early stages are unknown. The adults have been collected in the first half of June. According to Jaakko Kullberg (*in litt.*) "These *Ephysteris* moths were collected with two light traps with tube lamps. The container and funnel were dug in the sandy dunes… The moths start to arrive to the trap in the dusk and were running and jumping in the trap and sheets. The leaps were huge - even 20–25 cm long and as I remember the moths did not use wings when doing it".

The type locality (Figs 7–8) is a huge sand dune area in the south-eastern part of the Tuva Republic close to the border of Mongolia.

Etymology. The new species is named in honour of one of its collectors, Jaakko Kullberg, Finland.

Remarks. The type locality of *E. kullbergi* is spelled "Tore Khol" on some maps (Kosterin and Zaika 2003: 4).

In the mention of this species Karsholt and Sattler (1998) referred to its locality as "Tuvinskaya Respublika".

Ephysteris ustjuzhanini sp. n.

http://zoobank.org/3E2763FA-8934-4386-A710-31C14CBA3BE7

Material examined. Holotype, ♂, "Mongolia, Mongolsky Altai, 60 km SE of Khovd, Khar-Us-Nuur Lake, h-1300 m, 19.vi.1999, P. Ustjuzhanin "genitalia slide 210/14, O. Bidzilya" (ZMKU). Paratype ♀ (abdomen missing), "Mongolia, Gobi-Altaisky aimak, 30 km W of Tsogt, 25.vi.1999 P. Ustjuzhanin" (ZMKU).

Description. Adult (Fig. 5). Male. Wingspan 8.8 mm. Labial palpus recurved, segment 2 white with brown band on outer surface before apex, lower surface with brush of modified scales; segment 3 white with brown subapical ring. Antennal scape brown, flagellum brown with narrow white rings. Head, thorax and tegulae grey mottled with brown. Length of forewing 2.3 times its width in middle, abruptly narrowed towards apex after two-thirds; ground colour of forewing light brown, diffuse brown spot near base, on costa at 1/3 and in the middle of wing at 2/3; fringe cream, brown-tipped. Hindwing very short, about one-fifth to one-sixth length of forewing, light grey.

Female. Similar to male except for the following: forewing slightly longer (wingspan 9.0 mm) and broader (the length is 2.5 times its width in the middle), ground colour is lighter (cream rather than light brown), head white, thorax and tegulae cream rather than grey.

Male genitalia (Fig. 6). Uncus twice as long as broad at base, gradually narrowing towards rounded apex; gnathos-hook stout, of even width but the apex is slightly broadened, weakly curved, about as long as uncus; valva digitate, weakly broadened in distal half, evenly curved, with triangular pointed apex, extending to base of uncus; sacculus distinctly narrower than valva, weakly curved, broadened posteriorly, apex rounded, extending to about two-thirds of valva; vincular process broad, posterior margin denticulate, with a single, longer, slightly curved and pointed projection at medial apex, separated by deep and moderately broad medial incision; saccus longer than valva, narrowest in middle, weakly broadened before apex; phallus about length of tegumen, nearly straight, moderately stout, with triangular apical sclerite, coecum inflated, about one-third length of phallus.

Female genitalia. Unknown.

Diagnosis. *E. ustjuzhanini* is characterized by the forewings being strongly broadened in the middle together with very short hindwings that are the shortest among brachypterous *Ephysteris* species. The male genitalia are characterized by the vincular process having a comparatively long and strongly pointed distal projection. This projection is longer in *E. curtipennis* and *E. brachyptera* and missing in *E. kullbergi*.

Distribution. Mongolia.

Biology. Host-plant unknown. Adults have been collected in June.

Etymology. The new species is named after its collector Petr Ustjuzhanin, Russia, a specialist of the Pterophoridae and Alucitidae.

Remarks. Despite the differences between the male and female we are inclined to treat both specimens as the same species based on the general similarity of the forewing pattern.

Discussion

Hypotheses relating to brachyptery and its function in species of Lepidoptera are not uniform and each case should be looked at on its own merit (Sattler 1991: 244). It is not clear which factors benefit development of wing reduction in *Ephysteris*. It is found in species living on oceanic islands, in mountains and in sand dunes. The known larvae of *Ephysteris* species are associated with grasses (Karsholt and Sattler 1998: 36), and Sattler (1991: 248) comments that a number of Lepidoptera species with brachypterous females or with wing reduction in both sexes inhabit grassland, which constitutes a permanent, continuous habitat.

In Lepidoptera wing reduction is rare, being known from less than 1% of the described species (Sattler and Wojtusiak 2000: 435). It is usually confined to the female. In most cases species with brachyptery in both sexes are endemic to small oceanic islands or coastal localities. The crucial evolutionary factor that favours flightlessness in males is seen in the exposure of restricted habitats

to continuous strong winds (Sattler 1991: 251). Brachyptery in both sexes is exceedingly rare. According to Karsholt and Sattler (1998: 36) it is only known from 25 species, with a few additional species described subsequently (e.g. Sattler and Wojtusiak 2000, and Bidzilya 2014). Therefore, the two species described here represent a distinct addition to the number of known Lepidoptera with brachypterous males. All such species have brachypterous females.

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